National Report of Finland

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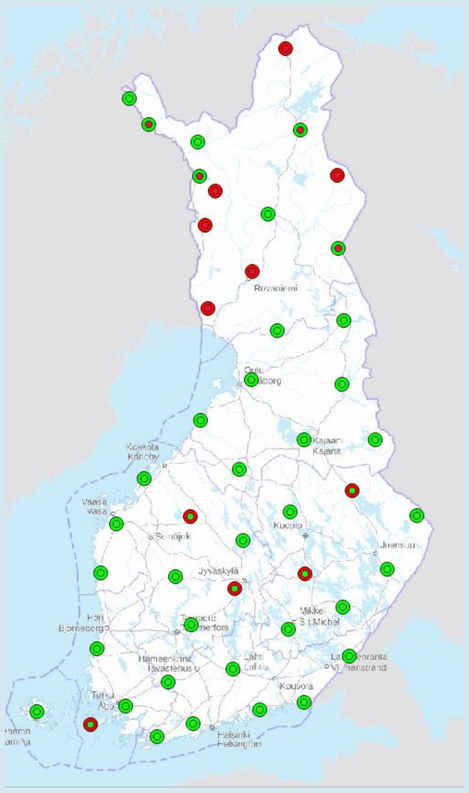
FinnRef: Backbone of Finnish reference systems

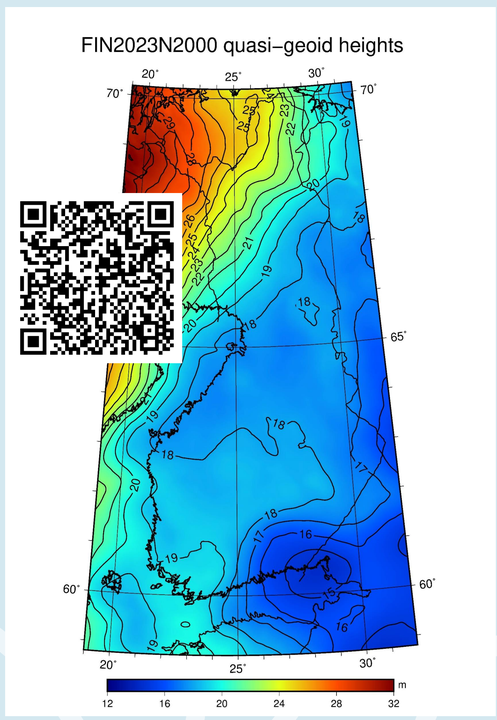
Finnish Geodesy strategy: FinnRef permanent GNSS network will be the backbone of Finnish terrestrial, vertical and gravity reference frames

- Precise levelled N2000 (EVRS) heights for all (or most of the) stations by ~2025 (status 36/47)
- Centering measurements (heights from the levelled benchmarks to the GNSS antenna) (status 37/47)
- Repeated absolute gravity measurements
  - 20/47 stations with AG pillar measured every 3 years
- SAR reflectors
  - 7 stations with Zarges type, 5 stations with MK3D type (+ 2 at Aboa Antarctica)



New Finnish height transformation surface (geoid model) FIN2023N2000

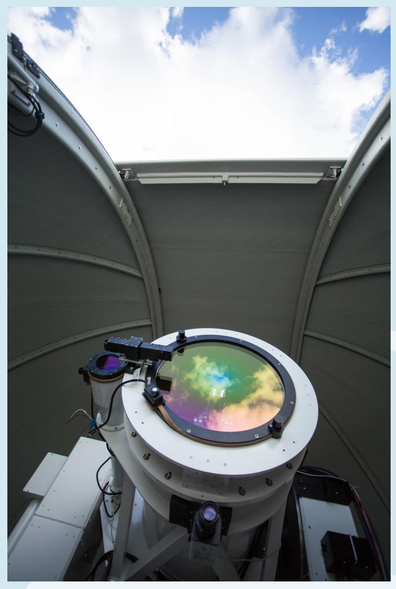
- New FIN2023N2000 model was released in 1/2024
- Gravimetric FIN_EIGEN-6C4_GEO-geoid model (calculated from global EIGEN-6C4 model and Finnish gravity data) fitted to GPS-levelling data → FIN2023N2000
- Height transformation surface: EUREF-FIN ↔ N2000
- Accuracy ~1.4 cm (1σ)
- Replaces previous FIN2005N00 model
- Data available at the NLS webpage
- Included in the Baltic Sea BSCD2000 model



National Standards Laboratory

FGI is the national standards laboratory for length and acceleration of free fall

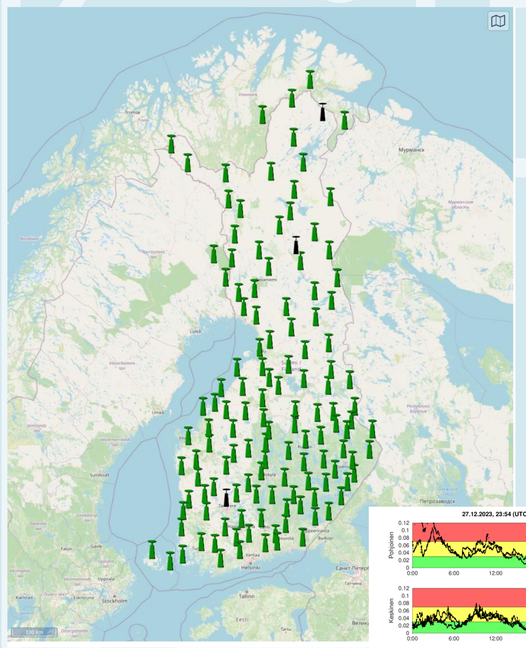
- Length
  - Levelling system calibrations for several clients
  - Nummela standard baseline for EDM calibrations – on pause until 2025
  - FGI_KML_Pituus@nls.fi
- Acceleration of free fall
  - CCM.G-K2.2023 – ICAG, Boulder, USA
  - EURAMET.M.G-K2.2023 – ECAG, Wettzell
  - Otaniemi – Vihti calibration line
    - 2023: RG: Otaniemi – Masala – Vihti
      - RG: weekly Scintrex CG6 measurements
    - 2024: AG & RG: Otaniemi – Vihti
      - RG: gradients on all points
  - First International Peer-Review 13.2.2024
  - Contact: FGI_KML_Putoamiskiihtyvyys@nls.fi



Metsähovi

Metsähovi research station is one of the fundamental stations for the GGRF. It is under renewal:

- New Main Building is in use
- VLBI almost ready for observations
  - H-Maser needed
- SLR ready for first measurements by the end of 2024
  - Agreement with DiGOS Potsdam
  - New laser has arrived



FINPOS positioning service

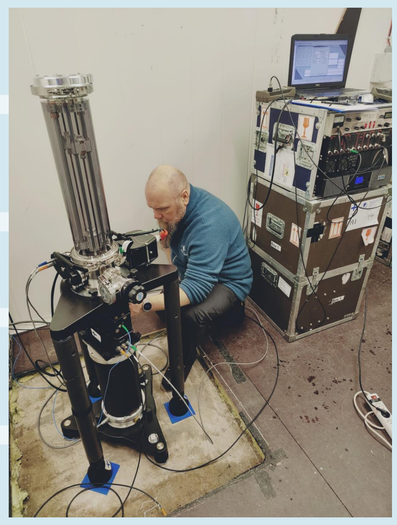
FINPOS is the GNSS positioning service of the NLS

- About 5-10 new stations per year, now own stations total about 100
- Used by the NLS (RTK) for all daily works, 437 RTK rovers in the NLS
  - + growing number of RD users out of NLS (RTK + SSR corrections)
- Raw data streams to 5 customers providing RTK/PPP services

2023/2024 FINNARP Expedition to Aboa, Antarctica

Updates to Finnish Antarctic station ABOA:

- GPS receiver and antenna upgraded
- 2 SAR reflectors installed
- Absolute gravity measured
- Local ties measured
- In situ ice measurements



EGNOS RIMS

- New EGNOS RIMS station (V2) into use in Kuusamo 12/2023
  - Enhancing performance of service in north-eastern Europe
- Both EGNOS stations in Finland are being upgraded to new V3 version (augments also Galileo). V3 and V2 stations will run parallel for years

NLS
FINNISH GEOSPATIAL RESEARCH INSTITUTE
FGI